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NOTES ON TERTIARY SHELLS.

BY OTTO MEYER.

In the Proceedings of the Academy of Natural Sciences, Phila., 1879, pp. 217-225, A. Heilprin gave in an essay, well worthy of perusal, a review of those species of the American Tertiary which had been hitherto compared and identified with European ones, and then identifies the following:¹—

Cardita imbricata Lam. = *Cardita rotunda* Lea.

Cardita planicosta Lam. = *Cardita planicosta* Lam. (Conr.).

Corbis lamellosa Lam. = *Corbis lirata* Conr.

Trochita trochiformis Lam. = *Trochita trochiformis* Lea.

Cypræa elegans Defr. = *Cyprædia fenestralis* Conr.

Actæon simulatus Sow. = *Tornatella bella* Conr.

Niso terebellatus Lam. = *Pasithea umbilicata* Lea.

I have seen and examined many American species in the museums of New York and New Haven, but my observations are chiefly derived from material of my own collection, consisting of several hundred German Oligocene species in addition to numerous

¹ Here are omitted all identifications, where Heilprin has any doubt, or which are not obtained by a direct comparison of specimens; of such are the following:—

Ostrea divaricata Lea, compared with *Ostrea flabellula* Lam.

Pecten Deshayesi Lea, “ “ *Pecten opercularis* Lam.

Cardium Nicolleti Conr., “ “ *Cardium semigranulatum* Sow.

Corbula oniscus Conr., “ “ *Corbula rugosa* Lam.

Cylichna galba Conr., “ “ *Bulla Brocchi* Bronn.

Tornatella pomilia Conr., “ “ *Tornatella inflata* Féruss.

Pyrula penita Conr., “ “ *Pyrula nexilis* Lam.

Cancellaria tortiplica Conr., compared with *Cancellaria evulsa* Brand.

Sigaretus declivus Conr., } “ “ { *Sigaretus canaliculatus*

Sigaretus bilix Conr., } “ “ { Sow

Solarium ornatum Lea, compared with *Solarium canaliculatum* Lam.

Pleurotoma nodo carinata Gabb, compared with *Pleurotoma denticula* Bast.

Mesostoma rugosa Heilpr., compared with *Mesostoma grata* Desh.

Melania Claibornensis Heilpr., “ “ *Melania mixta* Desh.

American ones. From these examinations I have been able to identify the following additional species :—

1. *Cerithium trilineatum* Phil.

? 1832. *Cerithium turellum* Grat.

Grateloup, Tabl. des Coq. foss. du bassin de l'Ad. Act. Linn., v, 5, p. 277.

1836. *Cerithium trilineatum* Phil.

R. A. Philippi, Enumeratio molluscorum Siciliæ, etc., vol. i, p. 195, tab. 11, fig. 13.

1840. *Cerithium terebralis* Ad.

C. B. Adams, Descr. of thirteen new spec. of New England shells. Boston Journ. Nat. Hist., vol. iii, p. 320, tab. 3, fig. 7.

1841. *Terebra constricta* H. C. Lea.

H. C. Lea, Descr. of some new spec. of foss. shells from the Eocene of Claiborne, Ala.; Am. Journ. Sc. a. Arts, vol. xi, p. 100, tab. 1, fig. 18, read Oct. 1840, publ. 1841.

1843. *Cerithium trilineatum* Phil.

Philippi, Beitr. z. Kenntn. d. Tertiaerverstein. d. nordwestl. Deutschlands, p. 23, p. 56, p. 75.

1848. *Cerithium trilineatum* Phil.

Wood, Crag Mollusca, vol. i, p. 70, tab. 8, fig. 4 a.

1856. *Cerithium trilineatum* Phil.

Hørnes, fossil. Moll. d. Tertiaerbeck. v. Wien, vol. i, p. 413, tab. 42, fig. 19.

1864. *Cerithium trilineatum* Phil.

Speyer, Tertiaerfauna v. Söflingen, Palæontographica, vol. ix, p. 32.

1866. *Cerithium mundulum* Desh.

Deshayes, Anim. s. vertèb. du bassin de Paris, vol. iii, p. 222, tab. 79, fig. 31, 32.

1867. *Cerithium Sandbergeri* (v Koenen non Desh.).

v. Koenen, Marine Mitteloligocæn v. Norddeutschland, Palæontogr., xvi, p. 104.

1883. *Cerithium Sandbergeri* (Meyer non Desh.).

O Meyer, Beitr. z. Kenntn. der Maerk. Rupelthons, Ber. d. Senckenb. Naturforsch. Ges., Frankfurt a. M., 1882-1883, p. 261.

1883. *Cerithium Meyeri* (Boettg.) [no description given].

Lepsius, Mainzer Becken, p. 50.

1883. *Cerithiopsis Meyeri* Boettg.; *n. sp.*

Archiv des Vereins der Freunde der Naturgeschichte in Mecklenburg, 1883, p. 247.

—— *Terebra trilirata* Conrad. When and where?

Having seen *Cerithium trilineatum* Phil. occurring in the European and American older and newer Tertiary, as well as in the Mediterranean, I sought for it among the recent shells of the American Eastern coast, and have received, through the kindness

of Professor Verrill, specimens of *Cer. terebralis* Ad., which species was the looked-for identical one.

The description and figure of *Terebra constricta* H. C. Lea are poor, but there is no doubt about this determination of my specimens from Claiborne which are quite identical with the German ones.

Among the synonyma, *Cer. mundulum* Desh. is given, although I have no specimens of this species; but I cannot find any difference to distinguish it from the figure and description given by Deshayes of *Cer. trilineatum*, and, as such a competent observer as Speyer has said the same, I do not think I have made a mistake.

Cer. trilineatum occurs in the American Miocene. I received one specimen of it labeled: "*Terebra trilirata* Conr.," but I could not find this name in any of Conrad's papers. Professor Heilprin writes to me: "Possibly it is one of the numerous forms that Conrad named without description."

If *Cer. trilineatum* Phil. should be identical with *Cer. turellum* Grat., of which I have no specimens, the latter name would have the priority.

Cer. trilineatum Phil. is generally distributed in the older and later Tertiary and also at the present time on both sides of the Atlantic.

2. *Pleurotoma denticula* Bast.

1825. Basterot, Descr. Géol. du bassin tert. sud-ouest de la France, p. 63, tab. 3, fig. 12.

1833. *Pleurotoma Baumonti* Lea.

I. Lea, Contrib. to Geology, p. 134, tab. 4, fig. 127.

1844. *Pleurotoma denticula* Bast.

Nyst, Descr. des. Coq. foss. de la Belg., p. 526, tab. 44, fig. 2.

1860. *Turris nodo-carinata* Gabb, fide Heilpr.

Gabb, Descr. of new spec. of Am. Tert. a. Cret. foss.; Journ. Ac. Nat. Sc. Philad., vol. iv, 2d series, p. 379, tab. 67, fig. 13.

1861. *Pleurotoma denticula* Bast.

Edwards, Monogr. of Brit. Eocene, p. 286, tab. 30, fig. 7 a-h.

1867. *Pleurotoma denticula* Bast.

v. Koenen, Mar. Mitteloligocæn, p. 89.

1879. *Pleurotoma denticula* Bast.

Heilprin, Proc. Ac. Nat. Sc. Philad., p. 214, tab. 13, fig. 10.

The last named author writes that he found *Pleur. denticula* Bast. in Claiborne sand. He figures a specimen without the upper part

of the spire and determined this species from descriptions and figures of European specimens. It is here only necessary to say that I concur in Heilprin's determination after having compared perfect shells from Claiborne with perfect German ones (Sternberger Oligocene). In my opinion a direct comparison of specimens is *conditio sine qua non* in the identification of species from both sides of the Atlantic.

The Claiborne specimens are apparently *Pleur. Baumonti* Lea, but the name of Basterot has the priority.

Pleur. denticula Bast., which occurs also in Italy, seems to be widely spread in the Tertiary.

3. *Pleurotoma Volgeri* Phil.

? 1804. *Pleurotoma terebralis* Lamarck.

Deshayes, Coq. foss. 1824-37, vol. ii, p. 455, tab. 62, fig. 14-16.

1846. *Pleurotoma Volgeri* Phil.

Philippi, Verzeich. d. in d. Geg. v. Magdeburg aufgef. Tertiaerverstein., Palæontographica, i, Aug. 1846, p. 69, tab. 10 a, fig. 2.

1847. *Pleurotoma cristata* Conr.

Conrad, Proc. Ac. Nat. Sc. Philad., iii, p. 284 (no figure).

1848. *Pleurotoma cristata* Conr.

Conrad, Journ. Ac. Nat. Sc. Philad., i, 2d series, p. 115, tab. 11, fig. 20.

1860. *Turris cristata* Conr.

Gabb, Journ. Ac. Nat. Sc. Philad., vol. ix, 2d series, p. 378, tab. 67, fig. 12, non fig. 8.

? 1861. *Pleurotoma Volgeri* Phil.

Edwards, Monogr. of the Eocene Moll. of England, p. 275, tab. 30, fig. 15 a, b, non fig. 13. (Publ. Paleontogr. Soc. London, issued as volume for 1858, publ. 1861.)

? 1861. *Pleurotoma terebralis* Lam.

Edwards, *ibid.*, p. 233, tab. 27, fig. 10 a-k.

1865. *Cochlespira engonata* Conr.

Conrad, Am. Journ. of Conchology, i, p. 142, figure in the same volume, tab. 21, fig. 12.

1865. *Cochlespira bella* Conr.

Conrad, *ibid.*, p. 210, tab. 21, fig. 6.

1867. *Pleurotoma Volgeri* Phil.

v. Koenen, Mar. Mittelligocæn, Palæontogr., xvi, p. 92.

1867. *Pleurotoma Volgeri* Phil.

Speyer, Conchyl. d. Casseler Tertiaers, Palæontogr., xvi, p. 193, tab. 19, fig. 12 a, b.

1872. *Pleurotoma terebralis* Lam.

Koch und Wiechmann, Die Molluskenfauna des Sternberger Gesteins in Mecklenburg, p. 66.

With the German specimens of the Maerkische Rupelthon and the Sternberger Oligocene, two specimens from Ashley, S. C., one from the upper strata of Claiborne (which are apparently Oligocene), and one specimen of typical *Pleurot. cristata* Conr. from Vicksburg were compared. The latter was obtained for comparison through the kindness of Professor Heilprin of Philadelphia.

Both German and American forms vary in slenderness; *Cochlespira engonata* Conr. is apparently one of the shorter specimens. In the American forms the number and sculpture of the revolving lines seem to be generally more developed, but these vary too. Conrad says: "*Cochlesp. bella* differs from *C. cristata* in having fewer and coarser lines and a more prominent carina."

What Edwards figures as *Pleur. Volgeri* Phil. looks quite different. Much more like seems to be his *Pl. terebralis* Lam., of which he describes six varieties. The opinions of the German authors as to the identity of *P. Volgeri* Phila. and *P. terebralis* Lam. are varying. I am greatly inclined toward uniting them, but for want of sufficient material prefer withholding a positive opinion on this point.

4. *Saxicava arctica* L.

1766. *Mya arctica* L.

Linn., Syst. Nat. ed. 12, p. 1113.

1836. *Saxicava arctica* L.

Philippi, Enum. Mollusc. Sicil., etc., i, p. 20, tab. 3, fig. 3.

1838. *Saxicava bilineata* Conr.

Conrad, Medial Tertiary or Miocene fossils of the U. S., p. 18, tab. 10, fig. 4.

1844. *Saxicava arctica* L.

Nyst., Coq. foss. Belg., p. 95, tab. 3, fig. 15 a-c.

1846. *Saxicava arctica* L.

Lovén, Ind. moll. Scand., p. 40.

1848. *Saxicava arctica* L.

S. V. Wood, Crag. Moll., ii, p. 287, tab. 29, fig. 4 a, b.

1856. *Saxicava arctica* L.

Hoernes, Wiener Becken, p. 24, tab. 3, fig. 1, 3, 4.

? 1860. *Saxicava Jeurensis* Desh.

Deshayes, Anim. s. vertèb., i, p. 170, tab. 10, fig. 18, 19, 20.

1863. *Saxicava bicristata* Sandb.

Sandberger, Conchyl. d. Mainzer Beckens, p. 277, tab. 21, fig. 6.

1864. *Saxicava bicristata* Sandb.

Speyer, Tertiaerfauna v. Soellingen, Palæontogr., ix, p. 48.

1867. *Saxicava arctica* L.

Weinkauff, Conchyl. d. Mittelmeeres, i, p. 20.

1868. *Saxicava arctica* L.

v. Koenen, Marin. Mitteloligocæn, 2d part, Palæontogr., xvi, p. 263.

Two specimens of *Saxicava bilineata* Conr. from the American Miocene prove to be the same variety as *S. bicristata* Sandb.

Wood has already said in 1848 (Crag. Moll. p. 288): "*Saxicava bilineata* Conr. is probably another variety of this species" (*S. arctica*).

I cannot see in the figure of *S. Jeurensis* Desh. any difference from our species. V. Koenen seems to be of the same opinion.

Saxicava arctica L. seems to be generally distributed in the older and later Tertiary and in the present time on both sides of the Atlantic.

New species were found by me in Claiborne sand, belonging to the American Museum of Natural History in New York, and which had been examined several times before. Afterwards I received sand from Claiborne myself and found most of these species again, as well as others that are new. Only the three following species, however, are published here, chiefly because the state of the literature on North American Tertiary invertebrates makes it almost impossible to determine with certainty new species and to find and to describe the differences from similar forms, already named.*

* In White's Bibliography there are given nearly seventy papers of the main author of this literature, T. A. Conrad, containing notes on American Tertiary mollusks; and even this list is not complete. Conrad's description and figures are mostly poor or very poor. He published a great many fossils without figures, many without localities, and not a few without giving even the formation; I have also found one without a name (Proc. Ac. Phil., 1862, p. 288). In his two check-lists of the older Tertiary (1865 and 1866) he ignores the species of H. C. Lea, and does not give an account even of all his own. Having a tendency to describe a variety as a new species and a species as a new genus, he found, of course, that not only the Miocene species are all different from the Eocene ones, but that even the groups of the Am. Eocene "hold few, if any, species in common."

PTEROPODA.

Tibiella Marshi (nov. gen. et nov. spec.)*

Shell thin, tubular. The closed end little convex. The lower part, about one third of the whole length, of a circular section, then by tapering a little forming a kind of a neck, above which the shell is of a rounded trigonal section. Aperture dilated.

Length, $3\frac{1}{2}$ mm.

Locality.—Eocene sand from Claiborne, Ala.

Remarks.—If the figured specimen is adult, in the young ones the apex may be perhaps

acute and afterwards partitioned off, as in the genus *Triptera* Quoy et Gaimard (*Cuviera* Rang).

This genus is allied to *Tibiella*, and the latter is perhaps a sub-genus of the former.

Pteropoda are described from the Miocene and Oligocene, but as far as I am acquainted with the literature this is the first Pteropod from the Eocene.

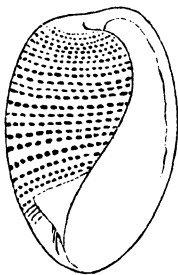
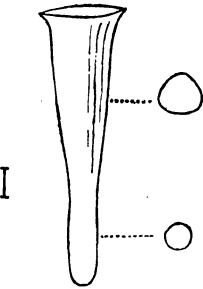
OPISTHOBRANCHIATÆ.

Bulla biumbilicata (nov. sp.).

Shell small, moderately thick, oval, the upper end obliquely truncated and umbilicated, the lower end somewhat tapering.

Last whorl most prominent at about one-third of the whole length. Outer lip? Inner lip below with a large trigonal thin callus, which covers a minute umbilicus. Surface with revolving lines, disappearing at both ends and generally most distant from each other at about the middle of the shell. A strong magnifying glass shows that these lines are furrows, looking like pearl-ribbons, which structure causes the surface to look

at some places as if it were minutely longitudinally costated.

Length, $2\frac{1}{2}$ mm.

* Genus name from the resemblance to the tibia of mammals. This species is dedicated to Professor Marsh, who enabled me to work by supplying me from his library with a large part of the necessary literature, which I could not get elsewhere.

Locality.—Eocene sand from Claiborne, Ala.

Remarks.—One specimen, the outer lip of which is not quite perfect.

An allied form seems to be *Bulla Horni* Gabb, of Fort Téton, Cal. (Gabb, Paleontology of California, vol. i, 1864, p. 143 [non p. 140], tab. 29, fig. 235), but this species is larger, thin, has no callus and seems to differ besides in form and sculpture. Gabb says: "Surface marked by numerous, very fine, impressed revolving lines."

Very similar is *Bulla ovulata* Lam. (Deshayes, Coq. foss. des env. de Paris, vol. ii, p. 39, tab. 5, fig. 13, 14, 15), but without callus.

Bulla subspissa Conr. (Proc. Ac. Philad., vol. iii, 1846, p. 20, tab. 1, fig. 29) from the Miocene of Calvert Cliffs, Md., seems to be of smooth surface; at least Conrad does not say anything about sculpture.

I cannot give the differences from *Bulla petrosa* Conr. (Am. Journ. Sc. a. Arts, vol. ii, 2d series, 1846, p. 399), as Conrad's full description of this shell is the following:—

"*Bulla petrosa*.—Oval, destitute of striæ?, summit oblique."

GASTEROPODA.

Cadulus depressus (nov. sp.).

Smooth, shining, gently curved, inflation not very prominent. Section everywhere an oval, one side of which is a little flatter than the other. Both ends oblique.

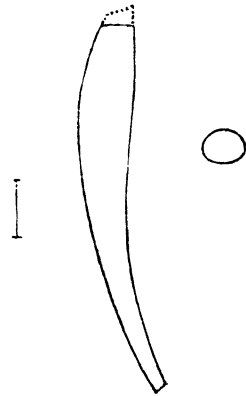
Length, 7 mm.

Locality.—Eocene sand from Claiborne, Ala.

Remarks.—The aperture of the figured specimen is not perfect, but I know that it is of the form indicated in the figure, from other specimens. I have seen altogether about a dozen specimens, and all are everywhere of the same oval section.

There are to be compared three North American species of *Cadulus*:—

1. *Gadus pusillus* Gabb, of the Téton group, Martinez, Cal. [Cretaceous or Tertiary?] (Gabb, Paleont. of Cal., vol. i, 1864, p. 139, tab. 21, fig. 99). Gabb says: "section circular."



2. *Dentalium thallus* Conr., of the Miocene of the Southern States (Journ. Ac. Nat. Sc. Philad., vol. vii, 1st series, 1834, p. 142). The specimens of this species in my possession have a circular section, except at the aperture, where they are oval. It is the opinion of Professor Verrill and of myself, that *Cadulus Pandionis* Verrill and Smith (A. E. Verrill, Catal. of Mar. Moll., Transact. Connect. Ac., vol. v, part. 2, 1882, p. 558, tab. 58, fig. 30 a) of the western part of the Atlantic is identical with this *Cadulus thallus* Conr., although the latter form has the aperture generally a little more oval. If Jeffreys is right (J. G. Jeffreys, "On the Moll. of the Lightning and Porcupine expedition," part v) in uniting *Cadulus Pandionis* Verrill and Smith, with *Cadulus Olivi* Scacchi from the Pliocene of Sicily, it would result that both late Tertiary species are also identical, and this would be one more instance of a Tertiary species occurring on both sides of the Atlantic.

3. *Ditrupa subcoarctuata* Gabb, Eocene of Texas (Journ. Ac. Nat. Sc. Philad., vol. ix, 2d series, 1860, p. 386, tab. 67, fig. 47). The description of Gabb is the following: "Arcuate, widened in advance of the middle; aperture contracted, circular; surface polished." As Gabb does not say anything about an oval section, but on the contrary writes "aperture circular," it is apparently a different species.